



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences
Programme Structure and Course Details
Of
MD Anatomy 2022 onwards

M.S. Ramaiah University of Applied Sciences
Ramaiah Medical College

Shalini

Principal and Dean

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Approved by the Academic Council at Its 27th meeting held on 27th September 2022



**RAMAIAH
UNIVERSITY**
OF APPLIED SCIENCES

M.S. Ramaiah University of Applied Sciences

Programme Specifications

MD Anatomy Programme 2022 onwards

Programme Code: MD127

M.S. Ramaiah University of Applied Sciences

Ramaiah Medical College

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University's Vision, Mission and Objectives

The M. S. Ramaiah University of Applied Sciences (MSRUAS) will focus on student-centric professional education and motivates its staff and students to contribute significantly to the growth of technology, science, economy and society through their imaginative, creative and innovative pursuits. Hence, the University has articulated the following vision and objectives.

Vision

MSRUAS aspires to be the premier university of choice in Asia for student centric professional education and services with a strong focus on applied research whilst maintaining the highest academic and ethical standards in a creative and innovative environment

Mission

Our purpose is the creation and dissemination of knowledge. We are committed to creativity, innovation and excellence in our teaching and research. We value integrity, quality and teamwork in all our endeavors. We inspire critical thinking, personal development and a passion for lifelong learning. We serve the technical, scientific and economic needs of our Society.

Objectives

1. To disseminate knowledge and skills through instructions, teaching, training, seminars, workshops and symposia in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to equip students and scholars to meet the needs of industries, business and society
2. To generate knowledge through research in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences to meet the challenges that arise in industry, business and society
3. To promote health, human well-being and provide holistic healthcare
4. To provide technical and scientific solutions to real life problems posed by industry, business and society in Engineering and Technology, Art and Design, Management and Commerce, Health and Allied Sciences, Physical and Life Sciences, Arts, Humanities and Social Sciences
5. To instill the spirit of entrepreneurship in our youth to help create more career opportunities in the society by incubating and nurturing technology product ideas and supporting technology backed business
6. To identify and nurture leadership skills in students and help in the development of our future leaders to enrich the society we live in
7. To develop partnership with universities, industries, businesses, research establishments, NGOs, international organizations, governmental organizations in India and abroad to enrich the experiences of faculties and students through research and developmental programme

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Programme Specifications: MD Anatomy

Faculty	Ramaiah Medical college
Department	Anatomy
Programme	MD – Anatomy
Programme Code	MD127
Dean of Faculty	Dr Shalini Nooyi
Head of the Department	Dr Ashwini C A

1. Title of the Award: MD in Anatomy
2. Mode of Study: Full-Time
3. Awarding Institution /Body: M. S. Ramaiah University of Applied Sciences, Bengaluru
4. Joint Award: Not Applicable
5. Teaching Institution: Ramaiah Medical College
6. Date of Programme Specifications: September 2022
7. Programme Approval by the Academic Council of MSRUAS: 27th September 2023
8. Programme Approving Regulating Body and Date of Approval: National Medical Council of India
9. Rationale for the Programme

The purpose of PG education is to create specialists who would provide high quality health care and advance the cause of science through research & training.

Department of Anatomy aims to train the post graduates as per the guidelines of National Medical Commission. The student after undergoing the training, should be able to deal effectively with the needs of the medical community and should be competent to handle all problems related to the specialty of Anatomy and recent advances. The post graduate student should also acquire skills in teaching anatomy to medical and para-medical students and be able to integrate basic sciences with clinical aspects.

This document guides the teachers and learners to achieve defined outcomes through learning and assessment.

Ramaiah Medical College is recognized worldwide for its infrastructure and innovative teaching learning methodologies. It has a strong medical education unit which helps the post graduates to improve on their teaching and communication skills. The Division of Research and Patents will guide the post graduate student to carry out research projects effectively.

Department of Anatomy has well equipped dissection lab, histology lab, integrated museum, post graduate research lab, demonstration rooms with ICT facility. Cadaveric skill lab adopts newer embalming techniques for cadaver preservation. Cytogenetic lab is equipped with PCR, karyotyping and FISH techniques. With competent faculty we will help the post graduate to be a best teacher and a researcher.



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Programme Outcomes (PO) for MD Anatomy Postgraduate students should

- PO1. have acquired the competencies pertaining to the subject of Human Anatomy that are required to be practiced at all levels of health system.
- PO2. have acquired skills of integrating human anatomy with other disciplines as and when needed.
- PO3. be aware of contemporary advances and developments in the field of Anatomy.
- PO4. be oriented to the principles of research methodology, conduct a project and submit thesis.
- PO5. have acquired qualities of a good teacher capable of innovations in teaching methodology.
- PO6. have acquired skills in effectively communicating with the students and colleagues from various medical and paramedical fields.
- PO7. be able to demonstrate adequate management skills to function as an effective leader of the team engaged in teaching and research.
- PO8. be able to discharge responsibilities and participate in National Health Education Programme.

Programme specific outcome (PSO) for MD Anatomy Postgraduate students

- PSO1. Demonstrate comprehensive knowledge and dissection skills of normal disposition, relations, functional & cross-sectional anatomy and surface anatomy of human body and recent advances.
- PSO2. Correlate the human anatomical structures with disease processes.
- PSO3. Demonstrate comprehensive knowledge of microscopic structure of human tissues & organs with functions to recognise altered state in various disease processes.
- PSO4. Perform various skills involved in histological techniques for preparation of slides.
- PSO5. Explain the sequential development of the organ systems & embryological basis of various major congenital anomalies and the principles of genetics in normal karyotyping, identify various karyotypes, principles of pedigree analysis, genetic counseling.
- PSO6. Demonstrate skills involved in preservation of cadavers through various embalming techniques & museum techniques.
- PSO7. Apply legal aspects with respect to anatomical acts to procure cadavers & demonstrate ethical behavior while handling cadavers, recognise continuing educational needs.

Note: A- Affective Domain, C- Cognitive Domain & P- Psychomotor Domain

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Course Code and name	Program Outcomes								Program Specific Outcomes						
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PS O 1	PS O 2	PS O 3	PSO 4	PSO 5	PSO 6	PSO 7
MDC501A Gross Anatomy, Embryology, Microscopic Anatomy of human body above the diaphragm with Radiological Anatomy & Body Preservation	3	3	2	2	3	3	3	1	3	3	3	2	3	3	3
MDC502A Gross Anatomy, Embryology, Microscopic Anatomy of human body below the diaphragm with General (Embryology & Microscopic) Anatomy	3	3	2	2	3	3	3	1	3	3	3	3	3	3	3
MDC503A Neuroanatomy & Genetics	3	3	2	2	3	3	3	1	3	3	3	2	2	3	3
MDC504A – Recent advances and applied Anatomy in medical sciences	3	3	2	2	3	3	3	1	3	3	3	1	2	3	3
MDP501A Thesis- Anatomy	0	0	2	3	1	2	2	1	1	1	1	1	1	1	1



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10. Regulations:**(A) Attendance, Progress and Conduct**

1. A candidate pursuing degree course should work in the concerned department of the institution for the full period as a full-time student. No candidate is permitted to run or work in clinic/laboratory/nursing home while studying postgraduate course. No candidate shall join any other course of study or appear for any other examination conducted by this university or any other university in India or abroad during the period of study.
2. All post graduate students shall undergo a compulsory rotation of 3 months in district hospitals as a part of "**District Residency Program**".
3. Each term (6 months) shall be taken as a unit for the purpose of calculating attendance. Attendance of 80% every term is mandatory for appearing in the final university examination.
4. Every student shall attend symposia, seminars, conferences, journal review meetings, clinical postings and lectures during each year as prescribed by the department and not absent himself / herself from work without valid reasons.
5. Every candidate is required to attend a minimum of 80% of the training during each academic term of the post graduate course. Provided further, leave of any kind shall not be counted as part of academic term without prejudice to minimum 80% attendance of training period every term.
6. Any student who fails to complete the course in the manner stated above shall not be permitted to appear for the University Examinations.

(B) Monitoring of progress of Studies

1. Work diary / Log Book - Every candidate shall maintain a work diary and record of his/her participation in the training programmes conducted by the department such as journal reviews, seminars, etc. as per the model checklists and logbook specimen copy.
2. Special mention may be made of the presentations by the candidate. The work diary shall be scrutinized and certified by the Head of the Department and Head of the Institution, and presented in the university practical/clinical examination.
3. Procedure for defaulters: There will be a committee constituted by all teachers to review such situations. The defaulting candidate is counseled by the guide and head of the department. In extreme cases of default, the departmental committee may recommend that defaulting candidate will be withheld from appearing the examination, if she/he fails to fulfill the requirements in spite of being given adequate chances to set himself or herself right.

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11. Teaching Learning Methods:

During the course, students should have formal training in teaching and research. The sessions should be in the form of:

1. **Didactic Teaching**
2. Topics in gross, surface and cross-sectional anatomy, microanatomy, embryology, neuroanatomy, histochemistry, and genetics taught by faculty members with integration with respective Clinical Departments.
3. **Presentation of Journal and seminars**
4. **Student Symposium once in every 3 months**
5. **Rotational Clinical / Community/Institutional postings**
6. The postings schedule with duration is given below: **Surger -2 weeks ,Radiology -2 weeks, Patholog -2 weeks , ENT -1 week , Ophthalmology -1 week , Obstetrics & Gynecology -1 week, Pediatrics -1week**
7. **Training in communication skills** - journal club, seminars, pedagogy, demonstrations, tutorials, lectures, quizzing.
8. **Hands-on experience** - techniques in microanatomy, neuroanatomy, gross anatomy, embryology, histochemistry, genetics, microscopy. Embalming and preservation of cadavers
9. **Teaching:** participate in the teaching and training programme of undergraduates. Participate in seminars, symposia, group-discussions and journal clubs.
10. **Educational technology** - preparation of Audio-Visual aids for teaching, posters/manuscripts for presentation in conferences/workshops and publication in journals.
11. **Participation in formulating evaluation methods:** Setting objective questions, Short Answer Questions, Multiple Choice Questions and Objective Structured Practical Examination (OSPE).
12. **Log Book:** Every student should maintain a logbook in which a record of the practical exercises completed should be entered. The Log books shall be checked and assessed periodically by the faculty members imparting the training.
13. **Research:** It is mandatory to complete the NMC prescribed online Basic Course in Biomedical research during first academic year. This is to introduce the student to basic research methods and to facilitate the completion of dissertation work in partial fulfilment of the course requirements. A postgraduate student would be required to present one poster/oral paper at a national / state conference and to present one research paper which should be published / accepted for publication during the period of his postgraduate studies so as to make him eligible to appear at the postgraduate degree examination. **Topics for the above presentation / publication should be other than the thesis work.**
14. Department encourages e-learning activities.



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13. Assessment:

Formative assessment should be continual and should assess knowledge procedural & academic skills, interpersonal skills, professionalism, self-directed learning and ability to practice in the system.

During the three-year training period,

A record of all theoretical, practical and experimental work done by the post graduate student and its assessment will be kept and shall be available for examiners at the time of the final practical and viva voce examination.

There will be periodical examinations (Part completion tests) during the course of training.

Internal assessments – Theory, Practical and Viva at the end of each academic year.

The pre- final theory and practical examination will be conducted.

During last six months the post graduate student will have weekly assessments.

All activities will be evaluated.

General Principles

Internal Assessment covers all domains of learning and used to provide feedback to improve learning; it also covers professionalism and communication skills.

Quarterly assessment during the MD training will be based on:

1. Journal based / recent advances learning
2. Cadaver based /Laboratory or Skill based learning
3. Self-directed learning and teaching
4. Departmental and interdepartmental learning activity
5. Continued professional development programmes
6. Progress of Thesis

The student to be assessed periodically as per categories listed in postgraduate student appraisal forms.



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SUMMATIVE ASSESSMENT:

The summative examination will be carried out as per the University Regulations as amended from time to time.

Scheme of Examination:

Every post graduate student shall carry out work on an assigned research project under the guidance of a recognised Post Graduate Teacher, the result of which shall be written up and submitted in the form of a Thesis. Work for writing the Thesis is aimed at contributing to the development of a spirit of enquiry, besides exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Thesis shall be submitted at least six months before the Theory and Clinical / Practical examination. The thesis shall be examined by a minimum of three examiners; one internal and two external examiners, who shall not be the examiners for Theory and Clinical examination. A post graduate student shall be allowed to appear for the Theory and Practical/Clinical examination only after the acceptance of the Thesis by all the examiners.

1. Theory

The examinations shall be organised on the basis of 'Grading' or 'Marking system' to evaluate and to certify post graduate student's level of knowledge, skill and competence at the end of the training. Obtaining a minimum of 50% marks in 'Theory' as well as 'Practical' separately shall be mandatory for passing examination as a whole. The examination for M.D. / MS shall be held at the end of 3rd academic year. An academic term shall mean six month's training period.

A. Theory (Written Paper) 400 marks

There shall be four question papers, each of three hours' duration. Each paper shall consist of 10 short essay questions each carrying 10 marks. Total marks for each paper will be 100.

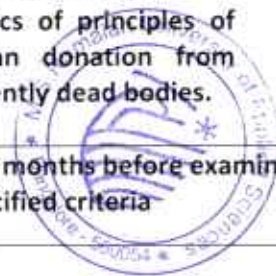
Name of the course	Course Code	Topics	Marks
Gross Anatomy, Embryology, Microscopic Anatomy of human body above the diaphragm with Radiological Anatomy & Body Preservation	MDC501A	a) Gross Anatomy of human body above the diaphragm i.e., upper limb, thorax, head and neck. b) Embryology & Microscopic anatomy of tissues and organs above the diaphragm.	100



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Gross Anatomy, Embryology, Microscopic Anatomy of human body below the diaphragm with General (Embryology & Microscopic) Anatomy	MDC502A	a) Gross Anatomy of human body below the diaphragm i.e., lower limb, abdomen and pelvis. b) Embryology & Microscopic anatomy of tissues and organs below the diaphragm. c) General Histology, General Embryology d) Principles of light, transmission and scanning electron microscopy, confocal, virtual microscopy.	100
Neuroanatomy & Genetics	MDC503A	a) Neuroanatomy - gross and applied aspects. b) General principles of genetics, cytogenetics as applicable to medicine and different genetic disorders, gene therapy.	100
Recent advances and applied Anatomy in medical sciences	MDC504A	a) Clinical and applied aspect of Anatomy b) Recent advances in the application of knowledge of anatomy on human body c) Basics of principles of organ donation from recently dead bodies.	100
Thesis-Anatomy	MDP501A	Approval 6 months before examination based on the specified criteria	



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Practical/clinical and Oral/viva voce examination**Practical Examination to be organized as per details given below:**

1. Dissection on cadaver
2. Histology spotting
3. Histological techniques
4. Surface Marking
5. Radiology
6. Teaching ability
7. Thesis presentation

Oral / Viva-voce Examination

On dissected parts of the whole human body including nervous system, and Embryology models, teratology, skeletal system including short bones, embalming techniques and genetics, radiographs, MRI, CT & ultrasonography.

Conduct of Practical examination

Practical examination should be spread over **two** days and include various major components of the syllabus focusing mainly on the psychomotor domain.

First Day Practical: To submit the duly signed gross anatomy file, histology file & the logbook and thesis.

Gross Anatomy:

Dissection and related viva voce, Major and minor dissections to be included.

Histology:

Spotting (10 spots) and viva voce

Preparation paraffin block making, section cutting and staining (H and E stain) with related viva on Techniques of tissue processing.

Second Day Practical:

- a) Microteaching of a short topic to assess teaching skills
- b) A short synopsis of the thesis work should be presented by the postgraduate student
- c) Viva including Gross anatomy, Cross sectional anatomy, radiological Anatomy, Surface Anatomy, Embryology.
- d) Oral/Viva voce examination on defined areas should be conducted by each examiner separately. Oral examination shall be comprehensive enough to test the post graduate student's overall knowledge of the subject focusing on psychomotor and affective domain.

Maximum marks for MD Anatomy	Theory	Practical	Viva + Dissertation topics + Pedagogy	Grand Total
	400	200	100	700

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Annexures

Annexure 1_ Subjects specific competencies and syllabus

Annexure 2_ Overall course plan year-wise

Annexure 3-Students appraisal forms

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Annexure 1: SUBJECT SPECIFIC COMPETENCIES

At the end of the course, the student should have acquired following competencies:

Cognitive domain

1. Describe gross anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord.
2. Explain the normal disposition of gross structure, and their interrelationship in the human body. She/He should be able to analyze the integrated functions of organs systems and locate the site of gross lesions according to deficits encountered.
3. Describe the process of gametogenesis, fertilization, implantation and placenta formation in early human embryonic development along with its variation and applied anatomy.
4. Demonstrate knowledge about the sequential development of organs and systems along with its clinical anatomy, recognize critical stages of development and effects of common teratogens, genetic mutations and environmental hazards. She/He should be able to explain developmental basis of variations and congenital anomalies.
5. Explain the principles of light, transmission and scanning, compound, electron, fluorescent and virtual microscopy.
6. Describe the microscopic structure of various tissues & organs and correlate structure with functions as a prerequisite for understanding the altered state in various disease processes.
7. Demonstrate knowledge about cell and its components, cell cycle, cellular differentiation and proliferation.
8. Describe structure, number, classification, abnormalities and syndromes related to human chromosomes.
9. Describe important procedures in cytogenetics and molecular genetics with its application.
10. Demonstrate knowledge about single gene pattern inheritance, intermediate pattern and multiple alleles, mutations, non-mendelian inheritance, mitochondrial inheritance, genome imprinting and parental disomy.
11. Describe multifactorial pattern of inheritance, teratology, structure gene, molecular screening, cancer genetics and pharmacogenetics.
12. Demonstrate knowledge about reproduction genetics, assisted reproduction, prenatal diagnosis, genetic counseling and ethics in genetics.
13. Explain principles of gene therapy and its applied knowledge.
14. Describe immune system and cell types involved in defense mechanisms of the body. Also explain gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.
15. Demonstrate knowledge about common techniques employed in cellular immunology and histocompatibility testing.
16. Demonstrate applications of knowledge of structure & development of tissue-organ system to comprehend deviations from normal.
17. Demonstrate knowledge about recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.
18. Explain collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.
19. Demonstrate knowledge about surface marking of all regions of the body.
20. Interpret various radiographs of the body, normal CT Scan, ultrasound and MRI.
21. Demonstrate knowledge about different anthropological traits and use of related instruments.
22. Demonstrate knowledge about identification of human bones, determination of sex, age, and height for medico legal application of anatomy



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Affective domain

1. Demonstrate self-awareness and personal development in routine conduct. (*Self-awareness*)
2. Communicate effectively with peers, students and teachers in various teaching- learning activities. (*Communication*)
3. Demonstrate
 - a. Due respect in handling human body parts & cadavers during dissection. (*Ethics & Professionalism*)
 - b. Humane touch while demonstrating living surface marking in subject/patient. (*Ethics & Professionalism*)
4. Acquire capacity of not letting his/her personal beliefs, prejudices and limitations come in the way of duty.
5. Appreciate the issues of equity and social accountability while exposing students to early clinical exposure. (*Equity and social accountability*)

Psychomotor domain

At the end of the course the student should be able to:

1. Identify, locate and demonstrate surface marking of clinically important structures in the cadaver and correlate it with living anatomy.
2. Acquire mastery in dissection skills, embalming, tissue preparation, staining and museum preparation.
3. Locate and identify clinically relevant structures in dissected cadavers.
4. Locate and identify cells & tissues under the microscope.
5. Identify important structures visualized by imaging techniques, specifically radiographs, computerized tomography (CT) scans, MRI and ultrasonography.
6. Demonstrate various movements at the important joints and actions of various groups of muscles in the human body.
7. Demonstrate anatomical basis of common clinical procedures expected to be performed by a basic medical doctor.
8. Demonstrate different methods of teaching-learning and make presentations of the subject topics and research outputs



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Specific practice based competencies:

Name/Description of practice based competencies
<p>1. Gross anatomy:</p> <ol style="list-style-type: none"> 1.1 Procurement, Embalming and Preservation of human cadavers 1.2 Preparation of tanks for preserving bodies 1.3 Dissection of cadaver 1.4 Window dissection of important regions 1.5 Preparation of specimens for museum with display <ol style="list-style-type: none"> (a) soft parts (b) models (c) charts 1.6 Preparation and preservation of human bones / skeleton as assigned by the faculty.
<p>2. Histology</p> <ol style="list-style-type: none"> 2.1 Preparation of common fixatives embalming fluid 10% formalin, Bouin's fluid etc 2.2 Making paraffin blocks and section cutting and mounting 2.3 Preparation of staining set for H and E staining and staining paraffin sections with the stain 2.4 Making celloidin, araldite, gelatin blocks and their section cutting 2.5 Processing hard tissues, decalcification of bones, block making and sectioning, Preparation of ground sections of calcified bones. 2.6 Frozen section cutting on freezing microtome and cryostat 2.7 Honing and Stropping of microtome knives, including sharpening by automatic knife sharpener 2.8 Histology record in which microscopic pictures of all the organs and tissues of the body should be drawn and describe salient features.
<p>3. Histochemical Methods</p> <ol style="list-style-type: none"> 3.1 Practical classes for staining of glycogen, mucopolysaccharides, alkaline phosphatase acid phosphatase, and calcium
<p>4. Cytogenetics</p> <ol style="list-style-type: none"> 4.1 Preparation of media, different solutions, stains etc. 4.2 Preparation of buccal smear for sex chromatin. Human chromosome preparation from peripheral blood and karyotyping. 4.3 Banding techniques (G and C) 4.4 Making of Pedigree charts for study of patterns of inheritance. 4.5 Chromosomal Analysis.
<p>5. Neuroanatomy:</p> <ol style="list-style-type: none"> 5.1 Dissection of brain and spinal cord for teaching and learning purpose. 5.2 Preparation of brain and spinal cord macroscopic and microscopic sections and identification of different parts in them. 5.3 Discussions on clinical problems related to neurological disorders and anatomical explanation for the same.

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SYLLABUS

A post graduate student, after three years of training in M.D. (Anatomy) should have acquired knowledge in the following aspects of anatomy:

Gross anatomy**Section - I**

Gross Anatomy of entire body including upper limb, lower limb, thorax, abdomen, pelvis, perineum, head and neck, brain and spinal cord.

Section - 2**Developmental anatomy/embryology**

General embryology: gametogenesis, fertilization, implantation and placenta, early human embryonic development.

Systemic embryology: development of organ systems and associated common congenital abnormalities with teratogenesis.

Physiological correlations of congenital anomalies.

Section - 3**Histology and histochemistry Cell Biology:**

Cytoplasm - cytoplasmic matrix, cell membrane, cell organelles, cytoskeleton, cell inclusions, cilia and flagella.

Nucleus - nuclear envelope, nuclear matrix, DNA and other components of chromatin, protein synthesis, nucleolus, nuclear changes indicating cell death.

Cell cycle - mitosis, meiosis, cell renewal.

Cellular differentiation and proliferation.

Microscopic structure of the body:

Principles of light, transmission and scanning, electron, fluorescent, confocal and virtual microscopy.

The systems/organs of body - Cellular organization, light and electron microscopic features, structure - function correlations, and cellular organization.



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Section - 4**Neuroanatomy:**

Brain and its environment, Development of the nervous system, Neuron and Neuroglia, Somatic sensory system, Olfactory and optic pathways, vestibulocochlear and gustatory pathways, Motor pathways, Central autonomic pathways, Hypothalamo-hypophyseal system, Limbic system, Basal ganglia, Reticular system, Cross Sectional anatomy of brain and spinal cord.

Detailed structure of the central nervous system and its applied aspect.

Section - 5**Genetics**

Human Chromosomes - Structure, number and classification, methods of chromosome preparation banding patterns. Chromosome abnormalities, Autosomal and Sex chromosomal abnormalities syndromes, Molecular and Cytogenetics.

Single gene pattern inheritance: Autosomal and Sex chromosomal pattern of inheritance, Intermediate pattern and multiple alleles, Mutations, Non- Mendelian inheritance, Mitochondrial inheritance, Genome imprinting, parental disomy.

Multifactorial pattern of inheritance: Criteria for multifactorial inheritance, Teratology, Structure gene, Molecular Screening, Cancer Genetics - Haematological malignancies, Pharmacogenetics.

Reproduction Genetics - Male and Female Infertility, Abortuses, Assisted reproduction, Preimplantation genetics, Prenatal diagnosis, Genetic Counseling and Ethics of Genetics.

Principles of Gene therapy and its applied knowledge.

Section - 6 Immunology

Immune system and the cell types involved in defense mechanisms of the body. Gross features, cytoarchitecture, functions, development and histogenesis of various primary and secondary lymphoid organs in the body.

Biological and clinical significance of the major histocompatibility complex of man including its role in transplantation, disease susceptibility/resistance and genetic control of the immune response.

Common techniques employed in cellular immunology and histocompatibility testing.

Molecular hybridization and PCR technology in immunology research particularly mechanism of antigen presentation, structural and functional relevance of the T cell receptor, genetic control of the immune response. Molecular basis of susceptibility to disease.



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Principal Section - 7 Applied anatomy and recent advances

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Clinical correlations of structure and functions of human body. Anatomical basis and explanations for clinical problems.

Applications of knowledge of development, structural (microscopy), neuro anatomy to comprehend deviations from normal.

Recent advances in medical sciences which facilitate comprehension of structure function correlations and applications in clinical problem solving.

Collection, maintenance and application of stem cells, cryobanking and principles of organ donation from recently dead bodies.

Section – 8 Surface Marking and Radiology

Surface marking of all regions of the body. Interpretation of normal radiographs of the body including special contrast procedures including barium studies, cholecystography, pyelography, salphingography. Normal CT scan, MRI and Ultrasound.

Anthropology

Different anthropological traits, Identification and use of Anthropological Instruments.

Departmental Resources:

Department of Anatomy should have the following laboratories, in addition to the other facilities. The laboratories should be well equipped for active research.

1. Gross anatomical dissections
2. Histology and Histological techniques
3. Immunology
4. Developmental anatomy
5. Anthropometry
6. Neuroanatomy
7. Cytogenetics
8. Imaging technique for Radiological Anatomy



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Annexure 2: OVERALL COURSE PLAN YEAR-WISE

ACADEMICS/RESEARCH/PROFESSIONALISM	
1 st Year	<ol style="list-style-type: none"> 1. Orientation to the subject and departmental activities 2. Understand the Competency, syllabus and assessment of the PG curriculum in Anatomy as per the University requirements 3. Attend regular Undergraduate MBBS lectures and practical – Dissection and Histology. Mandatory to attend all lecture/practical class 4. Start taking Undergraduate small group /dissection/osteology/histology under supervision 5. Gross anatomy: Dissection of one whole human body and study of gross anatomy 6. Histology - Basic techniques in tissue processing, preparation of blocks, microtome sections and H & E 7. Acquisition of embalming skills. 8. Start Journal clubs and seminars 9. Attend the PG research methodology training programme and mandatory to complete MCI /NMC prescribed online research methodology course 10. Attend the Post graduate Medical education training program (PG MET) 11. Selection of topic for thesis – Synopsis 12. Preparation and submission of the synopsis 13. Maintain logbook entry of all activities 14. Internal assessment I - theory, practical & viva voce 15. Begin review and data collection for thesis 16. Attend CME/Conferences / training Workshops 17. Preparation for Poster / Oral Presentation in state 18. Submission of 1st year logbook to HOD for signature Feedback from guide and HOD
2 nd Year	<ol style="list-style-type: none"> 1. Continue academic activities as per syllabus 2. Continue teaching of Undergraduate medical students 3. Plan for rotational postings 4. Continue Journal club and seminars 5. Complete record book 6. An oral / poster presentation in State / National conference /international conference 7. Submission of logbook entry to HOD signature with all entries of the teaching learning methods and training programmes 8. Internal assessment II – both theory, practical and viva voce 9. Review thesis preparation 10. Feedback from Guide and HOD
3 rd Year	<ol style="list-style-type: none"> 1. Continue academic activities as per syllabus 2. Continue teaching of Undergraduate medical students 3. Complete thesis 4. Presentation of thesis 5. Complete logbook entries 6. Practice pedagogy sessions 7. Preliminary examination (III IA– theory, practical and viva voce) three months prior to university examination 8. Feedback from Guide and HOD



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Annexure 3: STUDENTS APPRAISAL FORMS

3 (A): CHECK-LIST FOR EVALUATION OF JOURNAL REVIEW PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Article chosen was					
2.	Extent of understanding of scope & objectives of the paper by the candidate					
3.	Whether crossreferences have been consulted					
4.	Whether other relevant publications consulted					
5.	Ability to respond to questions on the paper /subject					
6.	Audio-Visual aids used					
7.	Ability to discuss the paper					
8.	Clarity presentation of					
9.	Any observation other					
	Total Score					



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3 (B): PEDAGOGY

Name of the candidate:

Date:

Register No.:

Centre:

Topic:

Max. Marks: 20

Skills		Marks
Marks Set induction (1.5marks)	Aroused interest in the beginning by relating to previous learning, throwing a new idea, questioning, etc. Specified the objectives of presentation	
Planning (5 marks)	Organized material in a logical sequence Used relevant content matter	
Presentation (5marks)	Changed the pace of presentation by shifting emphasis, joke, etc Used specific example to illustrate main Ideas • Used non-verbal cues, eye contact, etc	
Pupil participation (5 marks)	Allowed questions from students Asked question Solicited/Raised questions Rewarded pupil effort	
Use of AV aids (2.5 marks)	Used proper AV aids used the aid(s) effectively	
Closure (1 mark)	Summarized most important points at the end of the session Overall marks	
(out of 20)		



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3 (C): CHECK-LIST FOR EVALUATION OF SEMINAR PRESENTATIONS

Date:

Name of the Student:

Name of the Faculty/Observer:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	V. Good 4
1.	Whether other relevant publications consulted					
2.	Whether cross references have been consulted					
3.	Completeness of Preparation					
4.	Clarity of Presentation					
5.	Understanding of subject					
6.	Ability to answer questions					
7.	Time scheduling					
8.	Appropriate use of Audio-Visual aids					
9.	Overall Performance					
10.	Any other observation					
	Total					



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3 (D): CHECK LIST FOR DISSERTATION PRESENTATION

Name:

Faculty/Observer:

Date:

Sl. No.	Points to be considered	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Interest shown in selecting a topic					
2.	Appropriate review of literature					
3.	Discussion with guide & other faculty					
4.	Quality of protocol					
5.	Preparation of proforma					



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3 (E): CONTINUOUS EVALUATION OF DISSERTATION WORK BY GUIDE / CO-GUIDE

Name:

Faculty/Observer:

Date:

Sl. No.	Items for observation during presentation	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Periodic consultation with guide/co-guide					
2.	Regular collection of case material					
3.	Depth of analysis / discussion					
4.	Departmental presentation of findings					
5.	Quality of final output					
6.	Others					
	Total Score					



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3 (F): LOG BOOK

Academic activities attended by the student

Name:

College:

Admission Year:

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M.S. Parnianpour, M. Ghahramani / *Journal of Applied Sciences* 10 (2010) 1001–1006

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3 (G): LOG BOOK

Academic presentation made by the Student

Admission Year:

College:

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3 (H): POSTGRADUATE STUDENTS APPRAISAL FORM

PRE-CLINICAL DISCIPLINES

Date:

Name of the Department:

Name of the Student:

Period of Training: From To

0: Poor, 1: Average, 2: Good, 3: Very good, 4: Exceptional

Sl. No.	Particulars	Poor 0	Below Average 1	Average 2	Good 3	Very Good 4
1.	Has knowledge appropriate for level of training					
2.	Participation and contribution to learning activity (e.g., Journal Club, Seminars, CME etc)					
3.	Conduct of research and other scholarly activity assigned (e.g Posters, publications etc)					
4.	Documentation of acquisition of competence (eg Log book)					
5.	Performance in work based assessments					
6.	Self-directed Learning					
7.	Practical skills that are appropriate for the level of training					
8.	Respect for processes and procedures in the work space					
9.	Ability to work with other members of the team					
10.	Participation and compliance with the quality improvement process at the work environment					
11.	Ability to record and document work accurately and appropriate for level of training					
12.	Responsibility and accountability					



13	Contribution to growth of learning of the team					
14	Conduct that is ethically appropriate and respectful at all times					
15	Publications					
16	Presentation					
17	Basic Course in Biomedical Research					
	Has this assessment pattern been discussed with the trainee? Yes/ No					
	If not explain.					
	Name and Signature of the assessee					
	Name and Signature of the assessor					
	Date					

***REMARKS:** Any significant positive or negative attributes of a postgraduate student to be mentioned. For score less than 3 in any category, remediation must be suggested. Individual feedback to postgraduate student is strongly recommended.

SIGNATURE OF ASSESSEE

SIGNATURE OF HOD

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Course Specifications

MD Anatomy 2022 onwards

Course Code: MDC501A



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Course Specifications

Course Title	Gross Anatomy
Course Code	MDC501A
Department	Anatomy
Faculty	Ramaiah Medical College

Course Summary:

Demonstrate comprehensive knowledge and skills of normal disposition, relations, functional & cross-sectional anatomy of human body, embryological development and congenital anomalies, microscopic anatomy, various radiograms, CT and MRI scans of anatomical structures above the diaphragm

Course Outcomes:

- CO1:** Demonstrate comprehensive knowledge of normal disposition, relations, functional & cross-sectional anatomy of human body (Above the diaphragm) & the anatomical basis of disease process.
- CO2:** Explain the sequential development of the organ systems (Above the diaphragm) & embryological basis of various major congenital anomalies involved.
- CO3:** Demonstrate comprehensive knowledge of microscopic structure of human tissues & organs (Above the diaphragm) with their functions.
- CO4:** Interpret the various anatomical features of human body in various radiograms, CT and MRI scans (Above the diaphragm)
- CO5:** Demonstrate the surface anatomy of various structures of human body (Above the diaphragm)
- CO6:** Demonstrate skills involved in preservation of cadavers through various embalming techniques & museum techniques.

Course Content:

Gross Anatomy, Embryology, Microscopic Anatomy of human body above the diaphragm with Radiological Anatomy & Body Preservation



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes								Program Specific Outcomes						
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
MDC501A Gross Anatomy	CO 1	3	2	1	1	2	1	1		3	2				1	1
	CO 2	3	2	1	1	2	1	1		3	2	1		3	1	1
	CO 3	3	2	1	1	2	1	1		3	2	3	3	1		
	CO 4	3	2	1	1	1	1	1		3	2		2	1		2
	CO 5	3	2	1	1	1	1	1		3	2				1	
	CO 6	3		1	1			1		3	2		3	1	1	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																



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Course Specifications

MD in Anatomy 2022 onwards

Course Code: MDC502A

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Course Specifications

Course Title	Embryology, microscopic Anatomy of human Genetics
Course Code	MDC502A
Department	Anatomy
Faculty	Ramaiah Medical college

Course Summary:

Demonstrate comprehensive knowledge of normal disposition, relations, functional & cross-sectional anatomy of human body, embryological development and congenital anomalies, microscopic anatomy, various radiograms, CT and MRI scans of anatomical structures below the diaphragm General Histology, General Embryology, Principles of light, transmission and scanning electron microscopy, confocal, virtual microscopy.

Course Content:

Gross Anatomy, Embryology, Microscopic Anatomy of human body below the diaphragm with General (Embryology & Microscopic) Anatomy

Course Outcomes:

- CO1: Demonstrate comprehensive knowledge of General Anatomy & normal disposition, relations, functional & cross-sectional and radiological anatomy of human body (Below the diaphragm) & the anatomical basis of disease process.
- CO2: Explain the general embryology & sequential development of the organ systems (below the diaphragm) & embryological basis of various major congenital anomalies involved.
- CO 3: Demonstrate comprehensive knowledge of microscopy & ultrastructure of basic human tissues & organs (Below the diaphragm) with their functions
- CO4: Interpret the various anatomical features of human body in various radiograms, CT and MRI scans (Below the diaphragm)
- CO5: Demonstrate the surface anatomy of various structures of human body (Below the diaphragm)
- CO6: Perform basic H and E staining of tissues.



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes								Program Specific Outcomes						
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
MDC502A	CO 1	3	2	1	1	2	1		2	3	2				1	1
Embryology, microscopic Anatomy of human Genetics	CO 2	3	2	1	1	2	1			3	2	1		3	1	1
	CO 3	3	2	1	1	2	1			3	2	3	3	1		
	CO 4	3	2	1	1	1	1			3	2		2	1		2
	CO 5	3	2	1	1	1	1			3	2				1	
	CO 6	3		1	1			1		3	2	2	3	1		
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																



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Course Specifications

MD in Anatomy 2022 onwards

Course Code: MDC503A



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Course Specifications

Course Title	Neuroanatomy
Course Code	MDC503A
Department	Anatomy
Faculty	Ramaiah Medical college

Course Summary:

Neuroanatomy - gross and applied aspect. General principles of genetics, cytogenetics as applicable to medicine and different genetic disorders, gene therapy.

Course content**Neuroanatomy & Genetics**Course Outcomes:

- CO1:** Dissect brain and spinal cord, sections of brain and spinal cord and different parts.
- CO2:** Explain Anatomical basis for Neurological disorders.
- CO3:** Apply the principles of genetics in normal karyotyping, identify various karyotypes, principles of genetic counselling.



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes								Program Specific Outcomes						
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
MDC503A Neuroanatomy & Genetics	CO1	3	2	1	1	2	1	1		3	2	2	1	2	1	
	CO 2	3	3	1	1	2		1		2	3	1	1	1	1	
	CO 3	3	2	1	1	2	1			3	2		1	1		2
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																



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Course Specifications

MD in Anatomy 2022 onwards

Course Code: MDC504A



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Course Specifications

Course Title	Applied human Anatomy and recent advances
Course Code	MDC504A
Department	Anatomy
Faculty	Medicine

Course Summary:

Clinical and applied aspect of Anatomy, Recent advances in the application of knowledge of anatomy on human body, Basics of principles of whole body donation.

Course Content:

Recent advances and applied Anatomy in medical sciences

Course Outcomes:

CO1: Update their knowledge regarding recent advances and developments in anatomy.

CO2: Critically review journal articles

CO3: Apply legal aspects with respect to anatomical acts to procure cadavers & ethical behavior while handling cadavers.



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course Outcome	Program Outcomes								Program Specific Outcomes						
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PS O1	PS O2	PS O3	PS O4	PS O5	PS O6	PS O7
MDC504A Applied human Anatomy and recent advances	CO1	3	3	3	1		1			2	2	1	1	1	1	1
	CO 2	3	1	3	1		1			2	1			2	3	3
	CO 3	3	3	3	1		1			2	2	1	1	1	1	1
3: Very Strong Contribution, 2: Strong Contribution, 1: Moderate Contribution																

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Course Code: MDP501A



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Course Specifications

Course Title	Thesis- Anatomy
Course Code	MDP501A
Department	Anatomy
Faculty	Medicine

Course Summary: Thesis is aimed at exposing the post graduate student to the techniques of research, critical analysis, acquaintance with the latest advances in medical science and the manner of identifying and consulting available literature.

Course Content:

1. Basics and principles of research methodology
2. Principles of statistics
3. Synopsis writing
4. Research data collection and analysis
5. Thesis writing
6. Publication of research study

Course Outcome:

CO1: Conduct a research study using principles of research methodology



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Course Mapping (CO-PO-PSO Mapping)

Course Code and name	Course outcomes	Program Outcomes								Program specific Outcomes						
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PS O1	PS O 2	PS O 3	PS O 4	PS O 5	PS O 6	PS O 7
MDP501A Thesis- Anatomy	CO 1	1	2	2	3	1	2	1	1	1	1	1	1	1	1	



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Course Materials:Recommended Books and Journals Books (latest edition)**Gross Anatomy:**

1. Susan Strandring: Gray's Anatomy: The anatomical basis of clinical practice, ChurchillLivingstone Elsevier.
2. Dutta A.K. Human Anatomy vol. I-III Current Publisher.
3. Dutta A.K. Principle of General Anatomy. Current Publisher.
4. Romanes. Cunningham's Manual of Practical Anatomy vol. I-III, Oxford.
5. Keith and Moore Clinical Oriented Anatomy. Lippincot Williams and Wilkins.
6. R.S Snell. Clinical Anatomy by regions. Lippincot Williams and Wilkins.
7. J.V. Basmajin. Grant's Method of Anatomy. Williams and Wilkins.
8. R.J. Last. Anatomy Regional and Applied. Churchill Livingston.
9. Lee McGregor. Surgical Anatomy. K.M. Varghese.
10. A.G. R Deckeg, D.J du Pless Lee. Mc Gregor's Synopsis of Surgical Anatomy. Varghese Publishing House.
11. Snell. Clinical anatomy by regions. Lippincotts, Williams and Wilkins.
12. S. Chummy Sinnatanmy. Last's Anatomy Regional and Applied. Churchill Livingston.
13. Hollinshed W Henry. Anatomy for surgeons. Vol. I-III Lippincotts, Williams and Wilkins.
14. Vishram Singh. Clinical and Surgical Anatomy. Elsevier.
15. Vishram Singh. Textbook of general anatomy. Elsevier.
16. Frank H. Netter. Atlas of Human Anatomy. Saunders Elsevier.

Histology:

1. Young B. and Heath J. Wheater's Functional Histology. Churchill Livingstone.
2. M.H. E Ross. Histology: A textbook and atlas. Williams and Wilkins.
3. V. Bharihoke. Text book of human histology. Delhi AITBS.
4. Difiore's. Atlas of histology with functional co-relation.
5. Bloom and Fawcett. Text book of histology.
6. Carlton's. Histology Technique.
7. E.C. Clayden. Practical of section cutting and staining.
8. D W Cormack. Ham's Histology. Lippincotts, Williams and Wilkins.
9. Bloom and Fawcett. Textbook of Histology.

Genetics:

1. J.S Thompson and Thompson . Genetics in medicine. W.B. Saunders and Co. Philadelphia, London.
2. George Fraser and Oliver Mayo. Text book of Human Genetics. Blackwell Scientific Publications London, Oxford Edinburg, Melbourne.
3. Hann Sellwerger and Jame Simpson. Chromosomes of Man. Sparscher's International Medical Publications.

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M.S. Ramalah University of Applied Science,
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Approved by the Academic Council at its 27th meeting held on 27 September 2022

Embryology:

1. Hamilton, Boyd. And Mossman. Human Embryology.
2. TW Sadler. Langman's Medical Embryology. Lippincotts, Williams and Wilkins.
3. Keith L Moore and T.V.N. Persaud. The Developing Human. Saunders.
4. Rani Kumar. Text book of embryology. I.K. International New Delhi

Neuroanatomy:

1. Richard S. Snell. Clinical Neuroanatomy for Medical Students. Williams and Wilkins.
2. Parent. Carpenter's Human neuroanatomy. Williams and Wilkins.
3. Vishram Singh. Clinical Neuroanatomy. Elsevier.
4. A.K. Dutta. Essentials of Neuroanatomy. Current books international.
5. John A. Kiernan. Barr's the human nervous system, Lippincott, Williams and Wilkins.

Statistics:

1. David E. Matthews and Vernon T. Farewell. Using and Understanding Medical Statistics. Karger.

Radiology:

1. T.B. Moeller et.al. Sectional Anatomy CT and MRI Vol. I, II, III New York. Theme Stuttgart.
2. J.B. Walter et.al. Basic Atlas of Sectional Anatomy with correlated imaging. Saunders Elsevier.

Surface anatomy:

1. SP John, Lumley editors. Surface Anatomy, The Anatomical basis of clinical examination. London: Churchill Livingstone.
2. A.Halim. and A.C. Das. Surface Anatomy Lucknow. ASI, KGMC.

Journals:

1. 03-05 international Journals and 02 national (all indexed) journals

Shalini

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Yash Gao

Deen - Academics
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